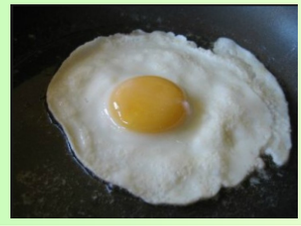
Waves	**Reflection, refraction and refractive index**

Learning objectives	**MUST (6)**	Recall the definitions of reflection and refraction
	SHOULD (7)	Define refractive index, and explain the use of Snell's Law to determine angles of refraction
	COULD (8/9)	Calculate wave paths for reflected and refracted waves

STARTER: Self-marking of hwk questions, checking SR from test
Your face is the right way up when you look at one side, and upside-down on the other. What and why?

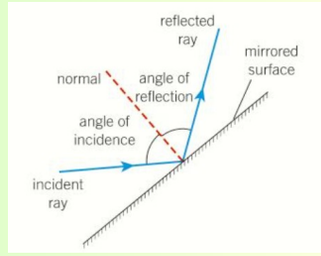
EXTENSION: What links..



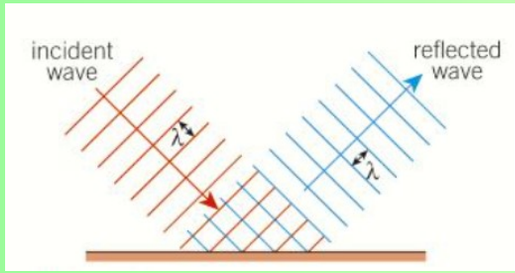
Oct 16-21:59

Waves	**Reflection, refraction and refractive index**
MUST (6)	Recall the definitions of reflection and refraction

Reflection: Law of reflection: angle of incidence = angle of reflection



(all angles measured from the **normal**)



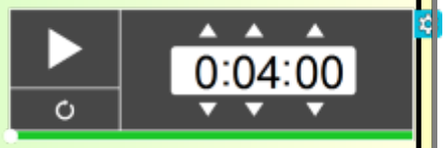
No change in f or λ

Curved mirror: must draw a normal at each point where a light ray enters.

Refraction: as waves slow down, they bend towards the normal

as waves speed up, they bend away from the normal.

Extension question: sketch light entering water at an angle. How would a sound wave look entering water at the same angle?



Sound travels **faster** in water so bends away from the normal.

Also note: water waves slow down in **shallower** water.

Total internal reflection:

If a ray goes from a denser to less dense medium, it may undergo **total internal reflection:** all of the light is reflected back inside the medium, and none leaves it. This happens at angles above a 'critical angle' from the normal.

(Do you think it matters what the other substance is, or just the denser substance?)

Oct 16-21:59

Waves	**Reflection, refraction and refractive index**
SHOULD (7)	Define refractive index, and use Snell's Law to determine angles of refraction and critical angles

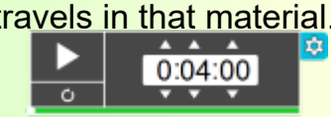
All materials through which light can pass have a **refractive index, n.** n = c/v, where c is the speed of light in a vacuum and v is the speed of light through the material.

a) will n ever be 1 or less?

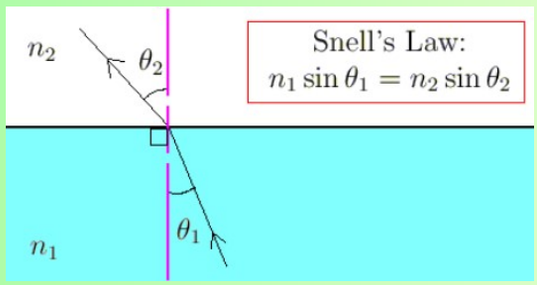
b) what are the units of n?

v = c/n: therefore, the higher the value of n, the slower light travels in that material.

A natural material with a high n is diamond (2.417)



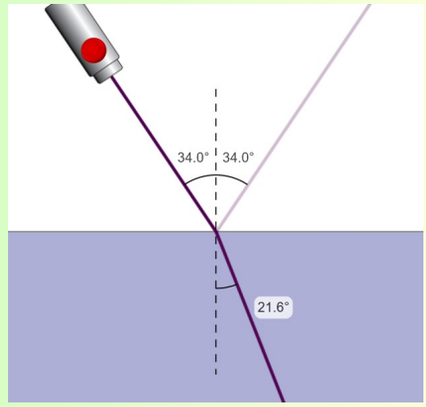
Snell's Law:



Oct 16-21:59

Waves	**Reflection, refraction and refractive index**
COULD (8/9)	Calculate angles for reflected and refracted waves

A light ray is sent into a block of glass at 34.0°. The refractive index of air is 1.00, and the refractive index of the glass is 1.520. What will the angle of the refracted ray be?



$n_1 \sin \theta_1 = n_2 \sin \theta_2$

We need θ_2 - rearrange: $\sin \theta_2 = (n_1 \sin \theta_1)/n_2$

$\sin \theta_2 = (1.00 \sin 34)/1.520 = 0.36789$

$\theta_2 = \sin^{-1}(0.36789) = 21.586°$

Oct 16-21:59

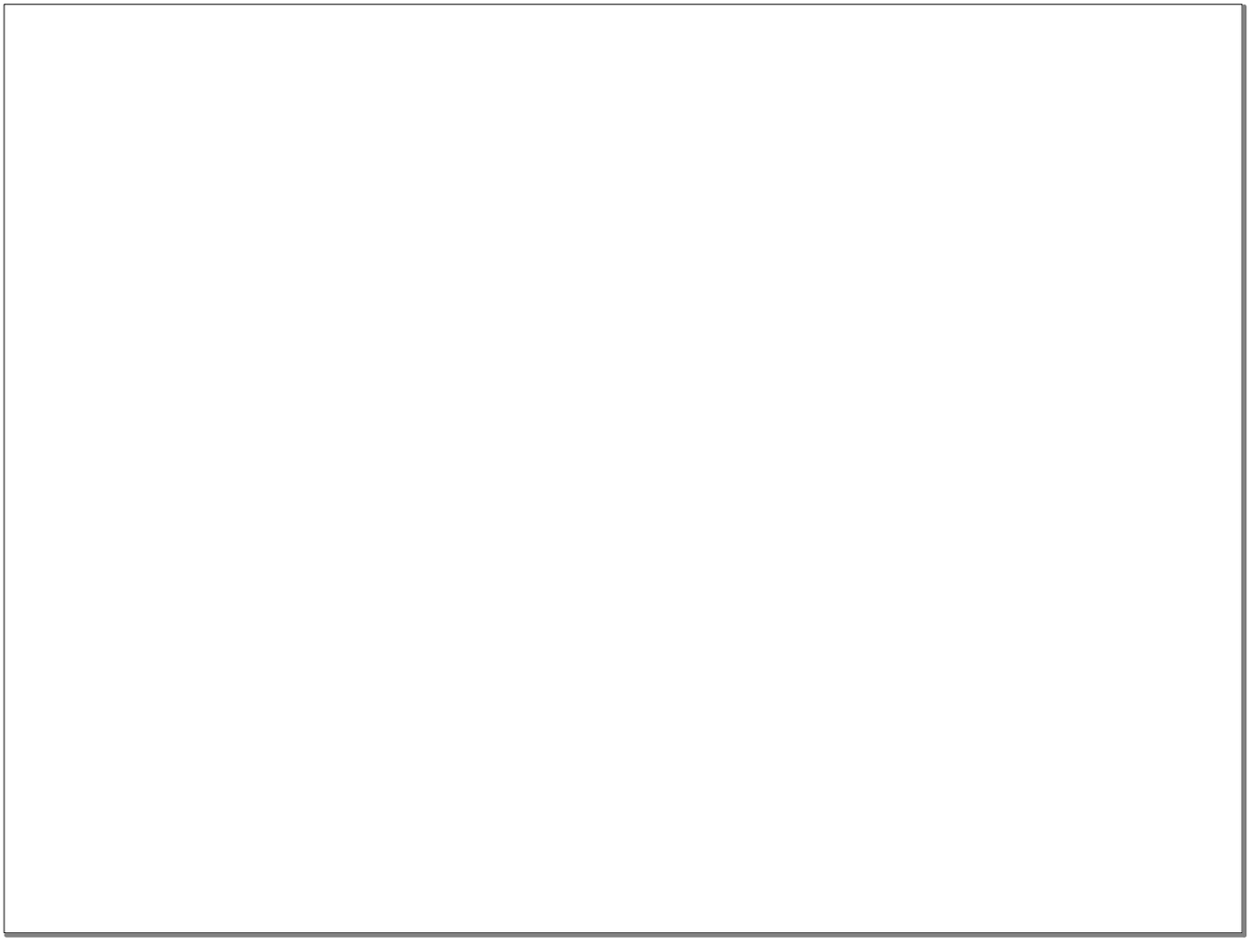
Waves	**Reflection, refraction and refractive index**

Learning objectives	**MUST (6)**	Recall the definitions of reflection and refraction
	SHOULD (7)	Define refractive index, and explain the use of Snell's Law to determine angles of refraction
	COULD (8/9)	Calculate wave paths for reflected and refracted waves

PLENARY: How can refraction help us to explain:
How a rainbow is formed?

EXTENSION: Why diamonds are so valuable?

Oct 16-21:59



Jan 16-23:00